

NCSX Audit #0314 (May, 2003)
Observations and Recommendations Tracking Log Update of 2/5/04

Observation or Recommendation Number	Observation or Recommendation / Disposition Plan
<p>Obs. 1</p> <p>Closed</p>	<p><i>Audit Report:</i> The NCSX Training Matrix has not been developed nor has training on the project requirements and systems been given. Such training is required by DOE O 414.1A, Attachment 1, Contractor Requirement Document, Criterion 2 – Personnel Training and Qualification, which states:</p> <ul style="list-style-type: none"> <i>a) Personnel must be trained and qualified to ensure they are capable of performing their assigned work.</i> <i>b) Personnel must be provided continuing training to ensure that job proficiency is maintained.</i> <p>The NCSX QA Plan, Rev. 0, approved 11/08/2002 states that this implementation for this requirement is specified in the NCSX Training Matrix.</p> <p>The impact of this observation is that interviewed individuals were not aware of project requirements or systems. Some are counting on project management to help them, as needed, navigate the project requirements. However, while high level project management may have the necessary knowledge of project requirements, WBS managers are not adequately aware of these requirements. Training will be key to effective use of the plans and procedures being developed by NCSX, since they tend to be much more rigorous than those used in the past at PPPL and they introduce much new terminology, nomenclature, and acronyms which are not familiar to PPPL staff. Prior to this planning, procedures should be developed to translate the requirements of the plans to the steps required by individuals – what they should do with their “hands and feet”.</p> <p><i>Project Response / Plan / Status (12/2/03):</i> The project, with Human Resources (S. Murphy-LaMarche and R. Worthy), have developed a training matrix, which was issued as part of the project’s performance baseline documentation. The key NCSX personnel and applicable training courses have been identified. Subjects include both Laboratory and NCSX-specific procedures. A gap analysis is being conducted to determine training needs. To address the concern raised here, one of the training courses is “NCSX Web-Based Project Engineering System”. The first session was conducted by W. Reiersen in August, 2003. The project and Human Resources will work together to follow through on the training plan.</p> <p><i>Project Responsible Person:</i> S. Murphy-LaMarche, W. Reiersen</p>

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Obs. 2 Closed	<p><i>Audit Report:</i> The NCSX Reliability, availability, Maintainability Plan referenced in the NCSX QA Plan remains to be developed. A schedule for this plan should be developed.</p> <p><i>Project Response / Plan / Status 2/5/04):</i> Project Engineering has developed a RAM Plan that addressed, for each system, its potential failure modes and how the system could be returned to operation. Comments on the draft plan have been incorporated for initial issue. The document is in final review.</p> <p><i>Project Responsible Person:</i> R. Simmons</p>
Obs. 3 Closed	<p><i>Audit Report:</i> Many extremely complex calculations are being performed for WBS 1 using complex analysis codes. Others within the project will be using the results for their designs. Typically the people performing these analyses are the most talented on the project within their specific areas. However, even extremely talented individuals may make mistakes that, if not detected in time, can have a significant impact on the project's success. The audit team was not provided with satisfactory answers that a method has been identified for the effective review of these analyses.</p> <p><i>Project Response / Plan (12/2/03):</i> All design-basis engineering analyses will be independently checked and the checking results will be documented. This is an FDR requirement. Project Engineering has created the new position of Technical Assurance Manager, reporting to the Engineering Manager, to elevate the visibility and attention to calculation checking and other Technical Assurance functions. Art Brooks has been appointed.</p> <p><i>Project Responsible Person:</i> A. Brooks</p>

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Obs. 4a Closed	<p><i>Audit Report:</i> With Everson out of business, are there available domestic suppliers for the conventional coils? If the project needs to go international to obtain these coils, the costs may be significantly higher. If it is decided to build these coils in-house, potential staffing and schedule impacts need to be addressed.</p> <p><i>Project Response / Plan:</i> The project will solicit budgetary cost estimates from industry for the TF and PF coils to support the PDR cost estimate. If there is inadequate response from domestic suppliers, the project will consider foreign suppliers or in-house fabrication, taking into account the issues raised here.</p> <p><i>Status (2/5/04):</i> An effort has begun to solicit interested vendors by providing a preliminary specification for the conventional coils now instead of after the final design is complete. Information will be posted on the NCSX Manufacturing Web Site, vendors will be contacted and a "sources sought" announcement will be posted on the Federal Business Opportunities (FedBizOpps or FBO) web site.</p> <p><i>Project Responsible Person:</i> M. Kalish</p>
Obs. 4b Closed	<p><i>Audit Report:</i> Until recently, the services of the Defense Contract Management Agency (DCMA) for on-site supplier inspections were free to PPPL. Now the Lab must pay for these. While NCSX, QA, and DOE/PAO are working on developing cost estimates for these services, this is included in the report as a reminder.</p> <p><i>Project Response / Plan (8/7/03):</i> An initial estimate of ~\$400k for DCMA QC services was developed by Frank Malinowski and is being incorporated into the budget for the QA Division.</p> <p><i>Project Responsible Person:</i> F Malinowski</p>

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Obs. 4c Closed	<p><i>Audit Report:</i> The cost estimates for WBSs 2 – 6 (excludes stellerator core systems) are based on experience and will not be at the PDR level when the project itself has its official PDR. While the team recognizes that this is driven by project funding, the project should be prepared to justify its estimates. There should be a formal process in place to do an internal validation of the costs (and associated schedule) prior to the External Cost Review.</p> <p><i>Project Response / Plan (12/2/03):</i> The cost and schedule estimates and technical bases for all systems were reviewed at the PDR, the Lehman PBR, and the EIR. An formal internal cost and schedule review process preceded these reviews. While not all systems are at the preliminary design level of maturity, all are well beyond conceptual design. The positive findings from all three of these external reviews confirm that the soundness of the WBS 2-6 estimates is accepted.</p> <p><i>Project Responsible Person:</i> WBS 2-6 Managers (Stevenson, Blanchard, Johnson, Ramakrishnan, Oliaro, Dudek, Gettelfinger)</p>
Obs. 4d Closed	<p><i>Audit Report:</i> Per DOE M 413.3-1, cost estimates should cover the entire project life cycle. Costs for D&D of the project have not been estimated.</p> <p><i>Project Response / Plan:</i> A preliminary cost estimate of \$1.9M for NCSX D&D was provided by Erik Perry.</p> <p><i>Project Responsible Person:</i> E. Perry</p>
Obs. 4e Closed	<p><i>Audit Report:</i> With the exception of WBS 4, the impact of Davis Bacon has not been considered. The project plans to resolve this before the PDR.</p> <p><i>Project Response / Plan / Status (2/5/04):</i> A draft request for Davis-Bacon determination was reviewed both internally and by PAO last year. Comments from this review were incorporated and the request has now been submitted to the Federal Project Director.</p> <p><i>Project Responsible Person:</i> R. Simmons</p>

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Obs. 5a	<i>Audit Report:</i> The schedule for the project PDR has slipped, but the prototype suppliers are still expected to adhere to the original, tight schedules. The audit team questioned whether this would impact the quality of the information supplied by them. The Project should consider providing some relief to these suppliers, if there is evidence that it is needed.
Closed	<p><i>Project Response / Plan:</i> Agreed. Supplier requests for schedule relief are handled by the contract technical representatives and are generally approved if they are due to PPPL delays. Currently it appears that the vacuum vessel prototype schedule may be met, while the modular coil winding form schedule will likely slip due to design delays. Supplier schedules are integrated into the project's WAFs and are updated as part of monthly statusing. The suppliers have also become involved in supporting behind-schedule design tasks in order to improve the overall schedule.</p> <p><i>Project Responsible Person:</i> P. Heitzenroeder (MCWF), M. Viola (VV)</p>
Obs. 5b	<i>Audit Report:</i> The project needs to develop a concise list of tasks to be accomplished prior to PDR, and track progress against same. Without such a list, it is difficult to assure that the PDR is ready to be performed.
Closed	<p><i>Project Response / Plan / Status (12/2/03):</i> Following the audit, the FY03 WAFs were re-baselined. Tasks to be accomplished were incorporated in the new WAFs and tracked monthly. In addition, Project Engineering tracked a list of critical issues to be resolved and deliverables to be produced for the PDR. The complete list of PDR deliverables was posted on the project web site and all were delivered in time for the October and November reviews.</p> <p><i>Project Responsible Person:</i> W. Reiersen, R. Simmons</p>

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Obs. 6a Closed	<p><i>Audit Report:</i> The redesign and fabrication of the NSTX TF inner leg, together with the prototype NCSX modular coil winding presents two major coil fabrication projects of major importance to the laboratory. The number of experienced persons at PPPL to accomplish and support this coil fabrication work is very limited.</p> <p><i>Project Response / Plan:</i> Agreed.</p> <p><i>Status (12/2/03):</i> Through good coordination and cooperation between NCSX and NSTX, and by shifting critical work scope to ORNL to free up PPPL resources, the needs of both projects were met during the critical time period leading up to the PDR.</p> <p><i>Project Responsible Person:</i> H. Neilson</p>
Obs. 6b Closed	<p><i>Audit Report:</i> In general at PPPL, there is limited knowledge in depth ("corporate knowledge"). For example, the individual most knowledgeable about the design and manufacturing of coils is working on both the NSTX redesign and NCSX. This could have a significant impact if key individuals were unavailable to key assignments.</p> <p><i>Project Response / Plan:</i> Agreed that this is a concern. Other engineers and technicians are beginning to acquire this experience through the NCSX winding development program and NSTX coil repairs. Specific individuals are being identified for crew leadership and engineering oversight responsibilities for coil building.</p> <p><i>Project Responsible Person:</i> M. Williams.</p>
Obs. 7 Closed	<p><i>Audit Report:</i> While facility improvements are, in general, funded with the GPP process, they need to be identified as early in the design as possible to assure that they are funded and implemented prior to significant project assembly work in the NCSX Test Cell.</p> <p><i>Project Response / Plan:</i> The NCSX Project Control Manager is the project's interface with the GPP committee and is responsible for identifying GPP projects important to NCSX, and when they are needed. The project has provided its list of its needed GPP projects and when they are needed to the relevant departments. The project is well represented on Laboratory committees which plan and approve GPP projects.</p> <p><i>Project Responsible Person:</i> R. Strykowski.</p>

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Obs. 8a Closed (Engineering is following up.)	<p><i>Audit Report:</i> The lack of as-built drawings and known state of the legacy equipment increases the level of risk for some tasks, e.g. meggering cables at C-site or the recent discovery that a 40' wall that was thought to be concrete is actually lead.</p> <p><i>Project Response / Plan / Status (8/7/03):</i> Agreed that this is a significant issue for the project and the Lab. For its purposes, the project is creating, as resources permit, an as-built CAD model for C-Site from the test cell out. The input data for the model are taken from a combination of available drawings and field observations and measurements. How we maintain and control such a model after operations starts is not clear and is an issue the Laboratory needs to address. The Laboratory Drawing Control committee is addressing the broader issues of C-Site documentation as a follow-up to Audit #0308, Drawing Control.</p> <p><i>Project Responsible Person:</i> T. Brown (NCSX point of contact for drawing issues)</p>
Obs. 8b Closed (Engineering is following up.)	<p><i>Audit Report:</i> The NCSX Documents and Records Plan (approved) and the Data Management Plan (near approval) both address the electronic generation and storage of drawings. There are a large number of existing vellum drawings that will be used by NCSX for auxiliary systems and maintained as such. Neither Plan addresses these drawings.</p> <p><i>Project Response / Plan / Status (8/7/03):</i> Existing vellum drawings will be managed according to existing laboratory procedures. The Drafting organization has developed a local data base that lists all legacy drawings. This data base is in the process of being transferred to a Microsoft Access data base that will be maintained as a Laboratory resource accessible to all.</p> <p><i>Project Responsible Person:</i> T. Brown. (NCSX point of contact for drawing issues)</p> <p><i>Laboratory Responsible Person:</i> J. Siegel</p>

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Obs. 8c Closed (Engineering is following up.)	<p><i>Audit Report:</i> Some of the hardware existing at C-site will remain for use by NCSX, for example, some power components. As systems and components are removed from C-Site, a system needs to be established to review drawings where they do exist for dispositioning. Some drawings may be discarded and some modified to reflect items removed. These decisions should be made by those most knowledgeable about the associated hardware and its potential use on NCSX.</p> <p><i>Project Response / Plan:</i> Addressed in Observation 8a.</p> <p>Project Responsible Person: T. Brown (NCSX point of contact for drawing issues)</p>
Obs. 8d Closed	<p><i>Audit Report:</i> WBS 4 has no plans for renumbering many existing (electrical) drawings. The logic behind this decision is sound as it will lead to less confusion, but it is inconsistent with the Data Management and Documents and Records Plans.</p> <p><i>Project Response / Plan:</i> The relevant project documents will be revised.</p> <p><i>Status (2/5/04):</i> Revisions have been made to the NCSX Data Management Plan and Document and Records Plan to address aspects of Observations 8a through 8e, including the above. It is currently out for signature.</p> <p><i>Project Responsible Person:</i> R. Simmons</p>
Obs. 8e Closed	<p><i>Audit Report:</i> Specific procedures for the processing of the various types of drawings within NCSX - Pro/Engineer, AutoCAD, vellum, etc. should be developed.</p> <p><i>Project Response / Plan / Status (8/7/03):</i> Minor changes to vellum drawings will be handled according to existing procedures. As appropriate, for example when a significant change is needed, vellum drawings will be converted to electronic format so that over time vellum drawings will be phased out. All NCSX drawings, whether vellum or electronic, are converted to portable document format (PDF), electronically signed as PDFs, and stored in the project's Pro/Intralink data base.</p> <p><i>Project Responsible Person:</i> T. Brown (NCSX point of contact for drawing issues), WBS Managers</p>

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Obs. 9 Closed	<p><i>Audit Report:</i> Changes to shared NSTX and NCSX systems, e.g., power supplies, site utilities, etc., need to be fully understood so that a change in a shared system for one project does not inadvertently affect the other. It helps that, for these shared systems, responsibilities are assigned by system, enabling the same individuals to be responsible for the same systems on both projects.</p> <p><i>Project Response / Plan / Status (12/2/03):</i> The D-Site power system is the responsibility of Al von Halle. Projects requiring modifications will provide specifications and funding, while the Al is responsible for implementation, safety, and configuration control. Al has been designated as the RLM for NCSX power systems (WBS 4) and neutral beams (WBS 25). Other shared resources will be managed in a similar way.</p> <p><i>Project Responsible Person:</i> A. von Halle.</p>

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Obs. 10 Closed	<p><i>Audit Report:</i> The Acquisition Execution Plan, revision 2, June 28, 2002, contains a requirement in section II.K to comply with the requirements of 10 CFR 45 (Energy Conservation). This is not a valid requirement. The intended CFR is 10 CFR 435, Energy Conservation Voluntary Performance Standards for New Buildings; Mandatory for Federal Buildings. There are no new buildings that are part of the NCSX project.</p> <p><i>Project Response / Plan:</i> Agree.</p> <p><i>Project Responsible Person:</i> R. Simmons</p>
Obs. 11 Closed	<p><i>Audit Report:</i> Plans are to wind the coils in the TFTR Test Cell. This is, however, a radiological area, requiring extra funds for addition Health Physics technicians (estimate \$400,000). There is also a risk that the coils may become contaminated, requiring extra time and effort to clean up. Also, when the time comes to build a new device in the TFTR Test Cell, additional costs will have to be borne to dismantle and relocate the coil winding facility. Are there alternative sites that could be used for this work? Or, could the \$400,000+ be put to better use to complete the decontamination of the Test Cell so that it is no longer a radiological area ?</p> <p><i>Project Response / Status (12/2/03):</i> Agreed that the requirement for HP surveillance in the TFTR test cell is a significant cost issue. Lower-cost alternatives were investigated including the suggestion made here, as well as other locations for winding the coils and assembling field periods. Ultimately it was concluded that the TFTR cell is the most economical choice, even with the HP surveillance costs included in the estimated.</p> <p><i>Project Responsible Person:</i>H. Neilson</p>

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Obs. 12 Closed (Engineering is following up.)	<p><i>Audit Report:</i> Some of the NCSX geometry is too complex to be communicated to suppliers via paper drawings, thus models will be used. The project should assure that appropriate documented controls are established for these models.</p> <p><i>Project Response / Plan / Status (8/7/03):</i> A new procedure for control and release of electronic drawings for fabrication is being developed by the Laboratory Drawing Control committee as a follow-up to Audit #0308, Drawing Control.</p> <p><i>Project Responsible Person:</i> T. Brown</p>
Recom. 1 Closed	<p><i>Audit Report:</i> Intralink is a database used to contain the approved drawings in PDF format. While the PC interface works well, problems exist with the Macintosh interface. Since much of the PPPL staff use Macintoshes, the interface should be improved.</p> <p><i>Project Response / Plan / Status 12/13/03):</i> The Computer Division has implemented and tested a solution, putting the Intralink client on the Lab Citrix Server. The new Citrix ICA Client and Server have been successfully installed and tested with the new Intralink 3.3 client. Macintosh users now have full access to all Intralink services including full color depth of rendered images.</p> <p><i>Project Responsible Person:</i> G. Oliaro</p>
Recom. 2 Closed	<p><i>Audit Report:</i> NCSX plans to use the PPPL Work Planning System once field work commences. Using the electronic WP system, a user can search the WP forms by number, date opened, text in the title (new feature just added), but not by WBS number or project. The project is part of the WP system so adding a search by project should be easy. The WBS number is not part of the database and would need to be added.</p> <p><i>Project Response / Plan / Status 12/13/03):</i> PPPL Engineering Management concurs in the need to revise the electronic WP and plans to implement it, although the timetable is constrained by the availability of qualified staff.</p> <p><i>Project Responsible Person:</i> R. Simmons</p>

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Recom. 3 Closed	<p><i>Audit Report:</i> For all major procurements, the Project should require that all documentation be provided in the native electronic format (electronic as-built drawings, word files, etc.) In addition, drawings should also be provided in pdf format. This will facilitate storage, access, and modification.</p> <p><i>Project Response / Plan / Status (8/7/03):</i> It is impractical to require all electronic documentation from suppliers. We can convert non-electronic documents to electronic format, namely PDF. The project's Documentation and Records Plan addresses archiving of non-electronic documents. We have discussed with Cheryl Such (Ops Center) and Al von Halle about archiving/storing contract deliverables and believe this issue is under control.</p> <p><i>Project Responsible Person:</i> R. Simmons</p>
Recom. 4 Closed	<p><i>Audit Report:</i> NCSX should consider maintenance access as a priority in laying out the machine proper, including platform etc. In the past, e.g., NSTX, access to the top of machine has been an afterthought, leading to inefficiencies and safety hazards, which could have been avoided.</p> <p><i>Project Response / Plan:</i> Agreed. Maintainability is addressed in the GRD and is a priority in the design process, especially in laying out the facility. For example, a catwalk was added to provide access to the top of the machine, in response to NSTX lessons learned.</p> <p><i>Project Responsible Person:</i> T. Brown (for maintaining the facility model) E. Perry (for providing input on maintainability requirements.)</p>

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Recom. 5 Closed	<p><i>Audit Report:</i> PPPL has limited experience with the engineering of cryogenic systems, including safety issues related to the same. Interaction with other machines, e.g., C-MOD, and/or industry with more experience would be beneficial. As a minimum, engineers with ample experience in this area should review the NCSX designs.</p> <p><i>Project Response / Plan:</i> Agreed. Geoff Gettelfinger, the project's cryogenic engineer, has visited MIT to discuss design and operational issues with Alcator C-Mod staff. Geoff has also contacted experts in industry for input on design approaches. Jim Irby of MIT, who is knowledgeable about cryogenic issues, will be a member of the NCSX PDR panel.</p> <p><i>Project Responsible Person:</i> G. Gettelfinger</p>

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Recom. 6 Closed	<p><i>Audit Report:</i> Field errors are a major concern, design driver, and technical risk area. The NCSX Project is very sensitive to this and has taken measures to minimize same by choosing non-magnetic materials, enforcing low permeability on welds, maintaining stellerator symmetry in structures, minimizing structural deflections via stiff structures, minimizing temperature rise, etc.. At the same time the physics requirements place very stringent tolerances (of order 1mm) on current centers which cause concern amongst engineers. Furthermore, it may be very difficult to develop means for measuring and mapping the fields to sufficient extent and with sufficient precision to confirm adequacy of engineering systems and understand machine behavior. It may be beneficial for the Project to document its approach to these issues, making sure that requirements on engineering systems are well defined, measurable, and achievable.</p> <p><i>Project Response / Plan:</i> Control of field errors is a high priority for the project and receives considerable attention as a design and fabrication issue. Some of the measures which the project is taking include:</p> <ol style="list-style-type: none"> 1) <input checked="" type="checkbox"/> Identification of field error sources and calculating their effects in terms of island width (Art Brooks), 2) <input checked="" type="checkbox"/> Adopting a “shim-as-you-go” winding approach to control the position of the winding center to high accuracy, 3) <input checked="" type="checkbox"/> Making provision for adjustability of the TF and PF coils after assembly, 4) <input checked="" type="checkbox"/> Establishing a metrology working group headed by Steve Raftopoulos to maintain an awareness of available technologies and develop solutions for NCSX metrology problems. The results of field error sensitivity analyses used as a design basis will be documented for the PDR. Metrology equipment to be used in fabrication and assembly will be identified in the documentation. <p><i>Project Responsible Person:</i> W. Reiersen</p>

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Recom. 7 Closed	<p><i>Audit Report:</i> Both the QA Order (DOE O 414.1A, Quality Assurance) and the ISM policy (DOE P 450.4, Safety Management System Policy) require continuous improvement. NCSX should develop a method for incorporating feedback from the staff to improve the systems and processes. Regular management assessments would provide an excellent means for project participants to feed back on the positive and negative aspects of their work experience on the Project.</p> <p><i>Project Response / Plan:</i> This audit and the follow-up have already provided a valuable mechanism for candid feedback to project management. The audit team and Human Resources have been very helpful in summarizing staff concerns that have been come up in their discussions and communicating them to NCSX management along with suggested solutions. One example is the need for training on NCSX web-based document management procedures, another is a set of concerns about drawing control. Positive feedback has also been received, reflecting a widely held enthusiasm for the project and its success. The NCSX Training course identified in Observation□ will be used as a further opportunity for feedback, including the use of chits.</p> <p><i>Status (2/5/04):</i> The project has conducted training sessions in its web-based management systems. Engineering meetings have been used from time to time for sessions on project plans, such as how it plans to use design reviews, work planning forms (WPs), and WAFs. A lessons-learned report was written recently, concerning management of cost-reimbursement contracts, and follow-up measures from that study have been implemented. The project subscribes to the continuous improvement philosophy and has taken measures to make it part of the project culture.</p> <p><i>Project Responsible Person:</i> H. Neilson</p>

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Recom. 8 Closed	<p><i>Audit Report:</i> Although formal value management and risk management plans are not required based on the cost to construct NCSX, much work has been done in this area. It is recommended that the project develop such plans, taking credit for work already performed.</p> <p><i>Project Response / Plan:</i> Agreed. The project will document results of value management measures such as the manufacturing studies by industry and the results of the project's VE task force. The project is taking some more formal risk management steps, including a documented risk management plan..</p> <p><i>Status (12/2/03):</i> The project's risk management and value engineering accomplishments and plans were documented for the PDR, and received very positive reviews from the PDR and PBR.</p> <p><i>Project Responsible Person:</i> P. Heitzenroeder (manufacturing), M. Zarnstorff (VE task force), J. Schmidt (risk management)</p>
Recom. 9 Closed	<p><i>Audit Report:</i> C-site is not controlled with the same level of rigor as D-Site. Some of the D-site controls have been made lab wide systems, e.g., the design verification process, and some are planned to migrate to lab wide systems, e.g., the temporary modification system. It is recommended that the Engineering Department review all D-Site systems and identify those having value to NCSX. These should either be made lab wide or systems unique for NCSX should be developed.</p> <p><i>Project Response / Plan:</i> Areas assigned to NCSX will be controlled using Lab-wide procedures to the extent possible, and project-specific procedures that meet or exceed Lab requirements where necessary.</p> <p><i>Project Responsible Person:</i> H. Neilson, W. Reiersen. <i>Laboratory Responsibility:</i> M. Williams</p>